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FORCE XXI: WHAT ARE THE IMPLICATIONS FOR THE U.S. ARMY SIGNAL CORPS?

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ABSTRACT

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Both the U.S. Army and its Signal Corps are facing enormous challenges as these institutions begin to deal with the possibilities of the FORCE XXI Army. The evolving operational doctrine of this future Army will totally alter our vision of warfare and the techniques, tactics and procedures required to win it. The requirements for command, control and communications will have to be redefined in light of this new doctrine. New Signal Corps doctrine will emerge and drive changes in force structure and operational procedures. In turn, the 21st century Army will require a new kind of Signal leader.

This paper examines the implications of the FORCE XXI Army on Signal Corps. The paper explores the changes required in Signal Corps doctrine and leader development. The conclusions and recommendations are aimed at highlighting the direction the Signal Corps needs to take as it moves into the 21st Century.

FORCE XXI: WHAT ARE THE IMPLICATIONS
FOR THE U.S. ARMY SIGNAL CORPS?

"Clearly, Information Age technology, and the management ideas it fosters, will greatly influence military operations in two areas - one evolutionary, the other revolutionary; one we understand, one with which we are just beginning to experiment."

From Chapter One of TRADOC PAM 525-5

This sentence from TRADOC Pamphlet 525-5, <u>FORCE XXI</u> <u>Operations</u>, alludes to the challenges facing both the U.S. Army and its Signal Corps as these institutions begin to deal with the possibilities of the FORCE XXI Army. The evolving operational doctrine of this future Army will totally alter our vision of warfare and the techniques, tactics and procedures required to win it. The requirements for command, control and communications will have to be redefined in light of this new doctrine. New Signal Corps doctrine will emerge and drive changes in force structure and operational procedures. In turn, the 21st century Army will require a new kind of Signal leader; one that is a master of his/her technical trade and is also an expert in art of battle command. Both of these talents will be needed to assist the commander in shaping and dominating the future battlefield.

The purpose of this paper is to examine the implications of the FORCE XXI Army on Signal Corps. My approach will be to first examine the underlying principles of the FORCE XXI process and postulate on those changes required in Signal Corps doctrine to meet the challenges of the 21st century battlefield. I will then examine what changes must be made in Signal Corps leader development in light of this new doctrine. My intent is to

determine what skills will be required by future Signal leaders
and what changes must be made to our leader development system.
My conclusions and recommendations will be aimed at highlighting
the direction the Signal Corps needs to take as it moves into the
21st Century.

FORCE XXI - GUIDING PRINCIPLES

TRADOC PAM 525-5 provides the overarching guidelines for the
FORCE XXI Army. This 1994 document lays out a vision for future
combat, a new concept for land operations and also speculates on
the implications of these two factors on all aspects of Army
culture. Another key document, Department of the Army Pamphlet
100-XX (Coordinating Draft), takes many of the same principles
laid out in TRADOC PAM 525-5 and applies them to the
institutional Army. The ideas and concepts in both documents
will have a major impact on the mission, structure and doctrine
of the 21st century Signal Corps.

What will be the demands of the future battlefield? Chapter
two of TRADOC PAM 525-5 lays out an interesting picture of the
future strategic environment. Our potential adversaries will
range from low tech agrarian based armies to complex, adaptive
armies armed with high-tech weapons possibly matching the
technical prowess of our own forces. The range of combat
operations will extend from general warfare fought by our entire
nation to a simple operation other than war conducted by a small,
specialized team. The threat from weapons of mass destruction
will increase as will the threat of the new family of

"information warfare" weapons. The defeat of all of these
threats will still require land forces but they will operate with
new operational tactics on a very different battlefield.[1]

Chapter three of TRADOC PAM 525-5 describes the future land
operations that will deal with this new family of threats. It
lays out five fundamental characteristics that define the FORCE
XXI Army:

> Doctrinal Flexibility: Well defined principles which will
> guide land operations over the entire spectrum of conflict.

> Strategic Mobility: Get to the right place at the right time
> with the right capability.

> Tailorability & Modularity: Putting the right capabilities
> in the correct sized organization with the necessary battle
> command structure.

> Joint, Multinational and Interagency Connectivity:
> Integrate effectively with other organizations necessary to
> "win the fight."

> Versatility in War and OOTW: Be successful at waging general
> war or conducting a variety of other types of operations.[2]

These characteristics demand a new type of battle command
structure. It will be based on information age technologies that
give the commander a greater degree of situational awareness that
significantly increases his ability to successfully wage war.
This emerging battle command structure is more that a new
computer and communications systems; it is new procedures,
techniques, tactics and new leadership methods which allow the
commander at all levels to maximize the effectiveness of his/her
forces.

The draft DA PAM 100-XX focuses on the redesign of the
institutional Army in response to the changing requirements of
FORCE XXI. This portion of the Army has the responsibility to

organize & equip the force, train soldiers & leaders, mobilize
and deploy forces and sustain the entire Army.[3] The pamphlet
goes on to state that the introduction of "Information Age"
techniques and digitization will allow these responsibilities to
be carried out more efficiently. The introduction of these
technologies will allow the Army to "flatten" its organization
and become more efficient. The overall aim is to better support
the operational forces either preparing for or engaged in 21st
century warfare.

Both of these documents envision an Army that is able to
capitalize on emerging "Information Age" technologies to make
itself more efficient at accomplishing its core competencies.
These new technologies will lead to both new material systems
that handle information more efficiently and to new ways of
thinking about or absorbing information to create knowledge in
the mind of the commander. Both documents contend that all
facets of the Army culture will be influenced by this revolution.
However, the Signal Corps might be the part of the Army most
profoundly affected by these changes.

SIGNAL CORPS DOCTRINE: WHERE IS IT HEADED?

Force XXI operational concepts and the redefinition of the
institutional Army will drive new Signal Corps doctrine. This
emerging doctrine will evolve from the principles and
characteristics laid out in chapter three of TRADOC PAM 525-5,
from DA PAM 100-XX (Coordination Draft) and from the principles
laid out in JCS Publication 6-0, <u>Doctrine for Command, Control,</u>

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Communications, and Computer (C4) Systems Support to Joint Operations. This signal doctrine will define a communication architecture that is flexible and responsive to the commander's needs while being interoperable, mobile, survivable and sustainable.[4] The best way to get a glimpse of the direction of future Signal Corps doctrine is to map the characteristics of the FORCE XXI operational concept into requirements for information services. From here one can speculate as to the overall thrust of Signal Corps doctrine and the resulting changes in force structure and leader development.

The requirement for all doctrine emerging from the FORCE XXI process must meet the following requirement stated in chapter three of TRADOC PAM 525-5:

> ...Our Army must design organizations and develop capabilities that will allow it to be rapidly tailorable, rapidly expansible, strategically deployable, and effectively employable as part of a joint and multinational team to achieve decisive results in future War and OOTW in all operational environments.[5]

This requirement places enormous demands on the Signal Corps. Current doctrine is based on the AirLand Battle tenets developed during the early 1990's and attempts to cope with the demands placed on it by post-cold war deployments. Many of these deployments have given the Signal Corps some insight on how it needs to adjust its doctrine to satisfy FORCE XXI requirements. Operation DESERT SHIELD/STORM validated AirLand Battle doctrine while giving the Army a glimpse of the emerging requirements of an "Information Age" battlefield. The Army's operations in Somalia and Haiti were the proving grounds for evolving doctrine for large scale OOTW operations. In particular, the operation in

Haiti saw the application of technologies and techniques which increased the commander's situational awareness allowing him to alter his operational concept and pass it to his subordinate commanders in near real time to meet changing conditions in his battle space.[6]

The current peacekeeping mission in Bosnia is proving to be an excellent laboratory for new battle command technologies. New command and control techniques and systems are being tried as well as new communications systems. The results of these experiments will have a profound affect on the Advance Warfighting Experiments being conducted at Fort Hood, Texas as part of the FORCE XXI process.

What are the basic functions of the Army's Command, Control, Communications and Computer (C4) system? To be effective this system must accomplish four tasks:

1. Acquire data. This can be done manually (a scout observing enemy activity) or automatically (a radar return produced by an enemy aircraft on an air defense radar).

2. Process this data into information. Manually done by taking the scout's observations and producing a formatted report. Automatically done by a radar system by producing a track on an air defense radar screen in a command center.

3. Transport the information to a required location. The formatted spot report generated by the scout is transmitted via tactical communications to the intelligence officer in the brigade operations center. The radar track of the enemy aircraft is transmitted over tactical multichannel communications to a Patriot system command post.

4. Present the information in a manner useful to the commander. The scout spot report is posted on a map along with other reports which allows the intelligence officer to analyze enemy intent and portray it to the commander. The automated enemy aircraft track appears on a screen in a command post which allows the air defense unit commander to decide if he should engage the target.[7]

The intent of the entire process is to increase the

commander's knowledge so that he is able to make a decision affecting the outcome of the battle. This process is continuous. Depending on the intensity of the battle and the redundancy of communication systems it is possible to overwhelm both the system and the commander with raw data or processed information so that he does not have the knowledge necessary to make the correct decision. In order to be successful the process must provide accurate and timely information which is complete and usable. In most situations this information must be secure. In the dawning age of information warfare critical information must be protected from both enemy knowledge and from exposing it to potential manipulation. Signal Corps doctrine must take these four tasks and define the requirements for the devices and operational procedures needed to operate and manage them.

To accomplish these C4 tasks the Army has terminal devices, transmission and switching systems, and network control systems. Each portion plays an integral role in acquiring, processing, transmitting and presenting information for the commander.[8]

It could be argued that terminal devices are the most important part of the C4 architecture. These are the devices that will be used by the commander to acquire data, process it into information and display it in a manner useful to the commander. These devices include voice telephones, sensors, computers and other types of input/output devices. Terminal devices are the most visible part of the C4 architecture and require the greatest involvement by the operational forces during their design and development. Doctrine for these devices must address who is responsible for operating and maintaining the

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hardware and how the output software must be written to efficiently interface with and transit the transmission and switching systems.

The transmission and switching systems are the part of the C4 architecture that transport data and processed information between terminal devices. These systems include the tactical radios placed in tanks and carried on the backs of the infantry. It also includes the tactical communications network operated by Signal Corps soldiers as well as the telecommunications infrastructure operated by the Department of Defense. The doctrine for these systems must call for redundancy, security, modularity, mobility and interoperability. The doctrine for this portion of the architecture must meet the demands of TRADOC PAM 525-5 for strategic mobility, tailorability and modularity.

For the Signal Corps, emerging doctrine that defines how the corps will control the C4 architecture is critical. As terminal devices and switching systems become more complex the need for control increases in importance. Control has two components, network control and nodal control. The first deals with the rules for running the entire network while the second deals with managing the switching centers (or nodes) that make up the backbone of the C4 architecture. The demands placed on control doctrine by the principles laid out in TRADOC PAM 525-5 complicate the process. A large communications system is most efficiently managed centrally. For example, the current Corps level tactical multichannel system is centrally managed by the Corps Signal Brigade. This headquarters provides the management and direction for communications assets supporting the Corps

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troops and up to five deployed divisions. However, the demands
of the FORCE XXI Army will require a communications system (and
therefore its control system) to be modular in design. Signal
Corps doctrine must require that control systems be placed at the
lowest possible level to ensure the commander has adequate
capability to manage his network from initial employment through
follow on buildup and subsequent redeployment.

Control, therefore, becomes the center of gravity for the
modern C4 architecture to support the FORCE XXI Army. The
control of the C4 architecture will become a critical task for
Signal Leaders. The officer development system must recognize
this and devote sufficient resources to developing the required
knowledge and expertise to ensure offices master this skill.
This will be discussed in more detail later in this paper.

The tenets of Signal Corps doctrine will have to be applied
to the three components of the Army's Communications
architecture: combat net radio (CNR), data distribution system,
and the area common user system. These three interconnected
communications systems are the means used to carry data and
information around the battlefield. Each plays a key role at
different echelons of command and must be managed so that each is
performing at its maximum capability. The increased use of data
communications will demand that interfaces between the systems be
properly engineered and controlled to allow the seamless transfer
of digital traffic from one transmission medium to the other. The
commander must see a seamless "tactical internet" which carries
data or information quickly between terminal devices operating at
different levels of command.

Through all of this change the one underlying principle that has always guided Signal Corps doctrine will remain intact: provide the warfighter with collective, integrated and synchronized information systems through the entire spectrum of operations.[9]

THE FUTURE SIGNAL CORPS LEADER - REQUIRED SKILLS

Future Signal Corps leader will be key players in both executing battle command on the 21st century battlefield and in facilitating the new technologies introduced in the institutional Army. Not only will Signal Corps officers be responsible for installing, operating, maintaining and controlling the new age communications networks that will facilitate battle command but he/she will assist the commander in the role of information manager. Both responsibilities will demand new skills which must be taught in formal schooling and reinforced by both leader development in operational commands and by self development.

Signal Corps doctrine emerging from the FORCE XXI Army will also require changes to the officer development system. Network control of the C4 architecture described earlier in this paper will add new skills to the "tool box" of the signal leader managing the battle command network. In addition, signal leaders will need to understand the functionality of the different terminal devices connected to the communications network and how to manage the information which is exchanged between devices. More importantly, signal officers must understand how the information produced by these devices interrelates to the battle

command function. This by itself will place enormous demands on the leader development system.

In addition to being the technical manager of the FORCE XXI C4 system, the future Signal Corps leader will be the "Chief Information Officer" for the FORCE XXI commander. In the early to mid 1980's many large corporations faced the dawning of a new "information age" not unlike what the U.S. Army is facing now. These firms began to leverage emerging computer technology to increase profitability by reducing costs or by entering new markets and offering new services or products. The change that occurred in the role of the traditional data processor manager is analogous to the way in which the Signal Officer's role must now change in the FORCE XXI Army. John Rockart published a study in the <u>Sloan Management Review</u> which documented this phenomenon.

Professor Rockart found that information system (IS) executives migrated from dealing with technical issues to dealing with broader management questions. While still retaining management responsibility for a corporation's overall information systems architecture, today's information executives are involved in almost all operational and support aspects of a firm's business. Through a series of studies Rockart attempted to summarize the critical success factors exhibited by the information services managers of several major corporations. They are:

> 1. Successful IS executives must communicate with top management to ensure both parties understand the requirements and capabilities of each other. This two-way communication ensures that information systems are both meeting and anticipating the business needs of the corporation.

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2. Successful IS executives develop and nurture their personnel so there is a balance between required technical skills and the "people skills" needed to interface with the "customers" of the information systems.

3. The final critical success factor is the IS executive's ability to position his organization so that it is an integral portion of the corporations operation. This major task involves the integration of all telecommunications, information processing, and information gathering and disseminating functions into one unit. The IS executive must become the "Information Manager" for the corporation.[10]

Are these critical success factors valid for the Signal Officer of the FORCE XXI Army? While there are differences between the requirements placed on and the operating environments of corporate and military "Information Manager" there are certainly some similarities.

The key role of Signal leaders in the FORCE XXI Army will be facilitating the commander's battle command function. As described in TRADOC PAM 525-5, battle command is the "art of decision making, leading, and motivating informed soldiers ...into action to accomplish missions..."[11] Battle command has many components; one is the Army Battle Command System (ABCS). This "Information Age" system will allow the internetting of information across all the battle field operating systems. This internetting, managed by Signal Corps officers and non-commissioned officers, will give the commander an unmatched advantage in situational awareness.

Looking at the model established by Rockart to gauge success of an Information Services executive, the Signal leader of the future will have to accomplish these tasks:

1. Future Signal leaders must be experts in the technical and procedural portions of the battle command system. They will have to know not only the "system of systems" that permits the internetting of information resources but must

also understand each subsystem that connects to the network. This will demand that Signal leaders study and understand the information requirements of all battle field operating systems. This knowledge will allow the Signal leader to advise both the commander and subordinate units on how to maximize their efficiency when operating within the ABCS.

2. The most important task of Signal leaders will be leading the soldiers under their command that operate the communication system that facilitates the battle command structure. This leadership involves the motivation, training and caring for the soldiers involved in all aspects of the Signal Corps mission.

3. The last task is to assist the commander in his management of information. While by doctrine this task falls on the combat units operation officer (G-3 or S-3), the Signal leader is in a unique position to assist the commander in understanding the information presented to him and anticipating future information requirements of the commander. This role will ensure that the Signal leader understands the commanders intent and is able to adapt the communication and information systems to meet this needs.

Signal leaders, therefore, become key enablers of the battle command function. This unique responsibility demands that Signal leaders master several skills.

SIGNAL LEADER DEVELOPMENT

Chapter Four of TRADOC PAM 525-5 does an excellent job of laying out the challenges and goals of the FORCE XXI leader development system. The chapter highlights several aspects of FORCE XXI operations which will change the role of leader on the future battlefield. Leaders will be allowed to exercise more initiative because of increased situational awareness. This demands that leaders are more aware of the overall commander's intent and desired outcome of the operation. In addition, the future leader must understand joint and multinational operations and be skilled in all aspects of combat and noncombat operations. Leaders will have to be adaptable to new situations and

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conditions as well as have the ability to adjust to operations in new organizational arrangements designed to respond to a particular threat.[12]

Most experts agree that the FORCE XXI Army leader development should continue along the system currently established: institutional learning, operational experience gained in units, and self development. To meet the challenges of the 21st Century the types of skills taught and the methods used in the institutional settings, the importance of different types of experience gained in operational units and the importance of self development will change significantly.

The institutional pillar of the officer education system will need to focus equally on two aspects of the evolving FORCE XXI Army. First, each Signal Officer will need a thorough understanding of the art of battle command as seen from the eyes, ears and mind of the maneuver commander. This learning process should include lectures, seminars, discussions and, most important, role playing simulation of combat operations. Emerging simulation systems will allow young officers to get the taste, feel and smell of a virtual battle. Second, Signal Officers need to be experts in the communications systems fielded to support the battle command system. This education goes beyond simple understanding of how the system works to simulating the operation, maintenance and control of the system in operational environments. The goal is to teach young officers how to anticipate the commander's information needs as the battle unfolds and how to adapt the communications systems to meet those needs.

Any formal instruction dealing with battle command communications system must be structured around the four tasks accomplished by the C4 system: acquire data, process and transport information to desired destinations, and present the information in a logical manner that is useful to the commander. The instruction on the acquisition and processing of data into information should revolve around an in-depth understanding the Army Battle Command System and how the components of ABCS connect to the transportation system. Instruction dealing with the transport system should revolve around understanding communications methods and the means needed to control them. The instruction dealing with presentation should focus on the art of battle command and the thought process used by a commander to absorb information and develop his battle plan based on the knowledge that results.

The institutional learning environment will also need to place increased importance on teaching joint and combined operations. While this instruction can take place in specialized courses for certain officers, each Signal Officer will need an appreciation for and an understanding of the demands, requirements and capabilities of a Joint Task Force.

An officer's professional development will require closer management as the Signal Corps attempts to "grow" a more mature, operationally balanced officer corps. Actual assignments in operational units will have to be balanced between levels of command, types of staff assignments and opportunities to develop and demonstrate leadership qualities. The intent is to balance an officer's career so that he/she has an appreciation for the

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demands of battle command and has developed their expertise in the technical aspects of their career field. There is also a need to balance an officer's assignments between the operational and institutional portions of the Army as well as to provide opportunities so officers can experience joint operations.

Self development will take on a greater role in the FORCE XXI Army. There is no way the institutional education system will be able to keep up with the explosion in information technology that is just now starting to occur. Individual officers will have to expose themselves to the latest technologies through reading, distance learning or non-traditional learning. More senior officers will have the added responsibility of exposing junior officers to emerging concepts and techniques through imaginative professional development programs.

SIGNAL CORPS LEADER DEVELOPMENT MODEL

	Basic Course	Advance Course & CAS3	Operational Assignments	Self-Development
Acquire Data	Become Familiar	Understand Techniques	Gain Operational Experience	Master New Technology
Process Data	Become Familiar	Understand Techniques		Explore New Technology
			&	
Transport Info	Primary Focus	Master Control Systems		Track & Learn New Technology
			Develop	
Present Info	Become Familiar	Primary Focus	Leader Skills	Track New Technology

This figure summarizes the different aspects of the C4

system which must be stressed and mastered in the three portions of the leader development system. The institutional learning environment gives officers the opportunity to master the technical aspects of both battle command and managing the C4 system. The basic course will focus on ensuring an officer has a base knowledge of signal techniques and will introduce him/her to the battle command function. The advance course, on the other hand, will focus on the battle command function and the technical control aspects of the C4 architecture. Operational assignments will give the officer the opportunity to expand his/her experience level and will develop their leadership ability. Self development (whether in a structure professional development program or based on the officer's interests) will focus on staying current in emerging technologies and techniques.

The intent of this three pronged leader development system is to produce a new class of "information warrior." This warrior must understand the complete nature of the communications architecture as well as how to manipulate the C4 system to produce the timely and accurate information the commander must have to manage his battle space. In addition to the technical skills needed to manage and control the communications architecture the information warrior must understand the commander's intent, his strategy and the underlying doctrine of all the combat systems operating on the battlefield. This new "information warrior" will only be produced by balancing his/her technical knowledge with the operational experience of standing next to and advising the commander during the heat of battle.

The result of this three fold effort will be a Signal Corps

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officer who is truly the commander's Chief Information Services

Officer in the best sense of the word -- an officer that

contributes to the commander's ability of control his forces and

shape what occurs in this battle space, resulting in our forces

meeting their objections.

CONCLUSION & RECOMMENDATIONS

How is the current Signal Corps coping with these

revolutionary changes? What "mid-course corrections" are

necessary to ensure the Corps delivers the type of service the

future commanders will require and demand?

As stated above, Signal Corps doctrine emerging from the

principles of the FORCE XXI Army will drive both material

requirements for new C4 systems and the design of leader

development system need to "grow" an officer corps capable of

managing this system and leading the soldiers who will operate

it. The Signal Corps efforts to date have only done a fair job

of defining the C4 requirements and resulting doctrine for the

FORCE XXI Army. The current rewrite of FM 24-1, <u>Signal Support</u>

<u>to Army Operations</u>, does not go far enough in defining how the

Signal Corps will satisfy battle command requirements or how the

Corps will operate in the new battle space defined by TRADOC PAM

525-5.

Another effort by the Signal Corps leadership that does a

better job of defining these requirements is the evolving

"Warfighter Information Age Requirements." This briefing does a

better job of mapping warfighter requirements into material

systems which are required to satisfy them. The briefing does not provide the overarching doctrinal concepts that will lead the Signal Corps force structure, operations concepts and leader development requirements from the current AirLand Battle Army to the FORCE XXI Army. A coordinated White Paper that will lead all Signal Corps senior leaders through this very complex and challenging task must be developed.

The direction of Signal Officer leader development is proceeding properly but its progress is hindered by both lagging doctrine development and evaporating training resources. The future Signal Corps officer will face an operational environment that is ever increasing in complexity. New battle command systems will make the requirement for seamless, continuous communications an absolute operational "must." This will demand that Signal Corps officers become smarter and more technically competent than ever before. At a time when more institutional training is required to train Signal Corps officers the time allotted for it is decreasing based on shrinking budgets. More and more necessary material is either dropped from instruction or covered at a lesser degree of detail. In a world becoming more complex this equation is a recipe for disaster.

The Signal Corps leadership needs to make a realistic decision on the amount of training necessary for both entry level officers and junior captains and make their case to the Army leadership. This training must cover both the technical aspects of the Signal Corps and the details of the Army's Battle Command System. As discussed earlier, an officer will have to be an expert in both to meet the demands of the Army's operational

commanders.

While the FORCE XXI Army offers significant challenges it also offers great opportunities. The Signal Corps must meet these challenges by creating opportunities to develop its officer corps so it is able to provide the commander with the edge they will require to be successful.

ENDNOTES

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3. Department of the Army, <u>FORCE XXI Institutional Army Redesign,</u> DA PAM 100-XX (Coordinating Draft) (Washington: U.S. Department of the Army, 25 September 1995), 1-3.

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6. Robert S. Ferrell, "Operation Uphold Democracy: contingency communications and forced entry operations for Haiti," <u>Army Communicator</u> (Winter 1995): 11.

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the World Wide Web. This Home page is available by connecting
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    BG Morris J. Boyd, "Doctrine and FORCE XXI -- Leading the
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